

City of St. Charles Long Range Pavement Preservation Plan

Public Works Department

2016

The Goal of the Long Range Pavement Plan is to drive
recommendations for future CIP submittals.



City of St. Charles Long Range Pavement Preservation Plan

EXECUTIVE SUMMARY3

DATA COLLECTION5

PAVEMENT RATING.....7

FUTURE PAVEMENT CONDITION PREDICTION MODELING12

PROJECT PLANNING AND BUDGETING15

RECOMMENDED PAVEMENT PRIORITIZATION24

City of St. Charles Long Range Pavement Preservation Plan

EXECUTIVE SUMMARY

The City of St. Charles Long Range Pavement Preservation Plan is the first step in implementing a proactive pavement management strategy that identifies the optimal pavement preservation investment locations and treatments to maintain the overall transportation network at the highest possible level with a constrained budget. The goal of this effort is to maintain the highest performance standards while reducing the overall long-term costs of managing the City's street infrastructure program.

The City of St. Charles and the four other major cities in St. Charles County (O'Fallon, St. Peters, Lake St. Louis and Wentzville) applied for and received County Road Board funding for the collection and rating of pavement conditions. In the fall of 2013 the City of St. Charles contracted with Transmap Corporation from Upper Arlington, OH to collect, rate, and project the pavement conditions throughout the City, and the four partner municipalities within St. Charles County. The City's share of the overall project cost was approximately \$24,000 of the overall cost of \$480,000 providing the City with a large benefit for the investment level required for the shared project costs. Since implementation, St. Charles County Highway Department has also retained Transmap to perform similar services. By engaging all of the area stakeholders in this project the overall County and participating municipalities benefit from standardized pavement ratings. The result being that a score in one municipality is defined in the same manner and is identical to scores throughout the rest of the County. The pavement management system selected for this project was Micropaver. Micropaver is the APWA recommended pavement software and is recognized throughout the industry. In addition to Micropaver Pavement Condition Index (PCI) scores, the pavement condition was collected for rutting, and the International Roughness Index (IRI). These measures provide additional insight into the overall smoothness and ride of the pavement and can either correlate closely or disparately from the PCI which measures the structure of the pavement. By comparing these measures one can either confirm that the pavement is structurally damaged and does not ride smoothly, or can determine that a pavement does not ride smoothly but is not structurally degraded.

The City currently maintains pavement within a structured system that separates funding based on functional class. Arterials and Collectors are maintained and improved through CIP (Capital Improvement Program) Projects that the City routinely seeks outside (Federal and County Road Board) funding to complete. This allows the City to get approximately \$5 worth of improvements for every \$1 in City funds invested on these routes. Alternatively alleys and local streets are not able to compete for outside funding and improvements must be addressed solely through City funding sources. The investment in the local and alley networks is additionally programmed and implemented by pavement type and City neighborhood "zones". Neighborhood zones were developed as a way to identify work areas for pavement maintenance, and consist of neighborhoods and blocks of streets that are within a predetermined confined area. The zone identifies the boundaries for the work that is done together, this implementation strategy cuts down on the selected contractor's mobilization cost by limiting improvements to areas where the contractor can setup and complete work nearby without multiple relocations of equipment and resources. The zone approach will be employed in the administration of the contracted street maintenance programs for concrete and asphalt streets. In addition to this work the Street Division maintains lists of priority projects in accordance with the Street Maintenance Policies and Procedures. The policy breaks repair locations into high, medium and low priority and is derived through a complaint driven process. The Street Division works to address complaints that fall within the high category in a reactive manner while the role of the contracted street maintenance program is to

City of St. Charles Long Range Pavement Preservation Plan

proactively apply pavement maintenance to the streets that are predicted to benefit from the maintenance to the greatest extent. When repairs identified by the Street Division fall within the medium and low category and are also within the zones identified by the contracted street maintenance programs the contracted street maintenance program will repair these locations with the annual project. This approach allows the City to be both reactive to customer complaints and proactive in managing the overall health of the pavement network.

Pavement preservation treatment practices were reviewed during the implementation of the pavement condition inventory and rating project to determine if additional treatment types could provide benefits for increased pavement life at the same investment level. Traditionally the City has performed two pavement preservation treatments on asphalt (crack sealing and 2 inch mill and overlay) and two treatments on concrete streets (crack sealing and selective slab replacement) in addition to the complete reconstruction of pavement that has degraded past the point of repair. As a result of this project the City will implement the use of micro-surfacing on asphalt pavements to provide an additional treatment between crack sealing and a full 2 inch mill and overlay. This will provide additional value by extending the pavement life of asphalt sections that do not yet fall into the full 2 inch mill and overlay condition.

The collection and rating of the City's pavement by Transmap determined that the average Pavement Condition Index (PCI) for the City of St. Charles is 84.81 on a 100 scale. This data is further broken down into an average score of 78.95 for asphalt pavements and 90.09 for concrete pavements. The City's overall network average was 4th out of the 5 participating municipalities with only Lake St. Louis trailing the City of St. Charles, however 84.81 represents a score that would nationally be viewed as excellent. Based on the individual network scores and the Micropaver pavement condition prediction modeling tool several work plans were developed to illustrate the relationship between applied funding and future pavement condition. Several scenarios were developed to answer the most common questions related to pavement management including;

- How much would it cost to fix everything?
- How much would it cost to maintain the current condition?
- What happens to road conditions if the City maintains the current funding level?

The results were presented to the City Council in February 2015 for their consideration and direction on how to proceed. Council directed staff to maintain the current funding levels of approximately \$1 million annually on concrete and \$1 million annually on asphalt pavement maintenance. Council directed staff to increase the sidewalk repair amount to \$300,000 annually. These are the sidewalks that fall within Tier 2 of the Long Range Sidewalk Plan that are to be completed in conjunction with the annual pavement projects. The schedule of zones to be completed within the 5 year plan generated in this plan is subject to change from Council policy, priority and direction, annual unit cost fluctuation of repairs, and actual field conditions when the work is to be completed.

City of St. Charles Long Range Pavement Preservation Plan

DATA COLLECTION

In the fall of 2013 the City contracted with Transmap Corporation to conduct a Countywide Pavement Rating Project. This project spanned the five major municipalities located within St. Charles County including the City of St. Charles, City of St. Peters, City of O'Fallon, City of Wentzville, and the City of Lake St. Louis.

Prior to selecting Transmap to complete the project, Staff from each of the participating municipalities met to discuss the approach to the project. Each of the municipalities were using distinctly different data and methods for maintaining pavement inventories. These varying methods ranged from systems that rated pavement on a 1 to 10 scale to the system that was ultimately selected (MicroPAVER) which analyzes pavement on a 1 to 100 scale. Ensuring that a single pavement rating system and prediction modeling tool was being used amongst the municipalities was key to providing equity between the scoring of projects for outside funding, the understanding of pavement deterioration regionally, and receiving a cost effective bid from potential contractors. After collecting literature on the subject and discussing the pros and cons of several systems the consensus of the group was to require a rating system based in MicroPAVER. MicroPAVER is a software system developed by the Corps of Engineers that is currently maintained and promoted by APWA. Additional detail on the pavement scoring and prediction modeling in Micropaver can be found in subsequent sections of this plan.

The first step to completing the project post selection of Transmap was to collect the available data from each municipality to create a Countywide centerline file of the group's roadway network. Each of the five municipalities maintains separate and varying centerline files. Transmap took each of the centerline files and merged them together into a compatible format. In doing so there were areas where gaps and overlaps occurred. Transmap worked with each of the municipalities to understand how to resolve these ownership gaps and overlaps before collecting the data and assigning it to one of the municipalities inventory. Having this basis to work from Transmap put together a work plan to collect all the data within the participating municipalities utilizing specialized data collection methods performed while driving a van (pictured below).



Figure 1: Transmap Collection Van

City of St. Charles Long Range Pavement Preservation Plan

The van equipped with the specialized equipment drove each of the streets within the project area in each direction (2 way streets). While driving, the van captured images 360 degrees around the vehicle and downward approximately every 19 feet while capturing data from a downward facing laser. The image below shows an output from Transmap's data, each blue dot shown below represents a location where imagery and data were collected.

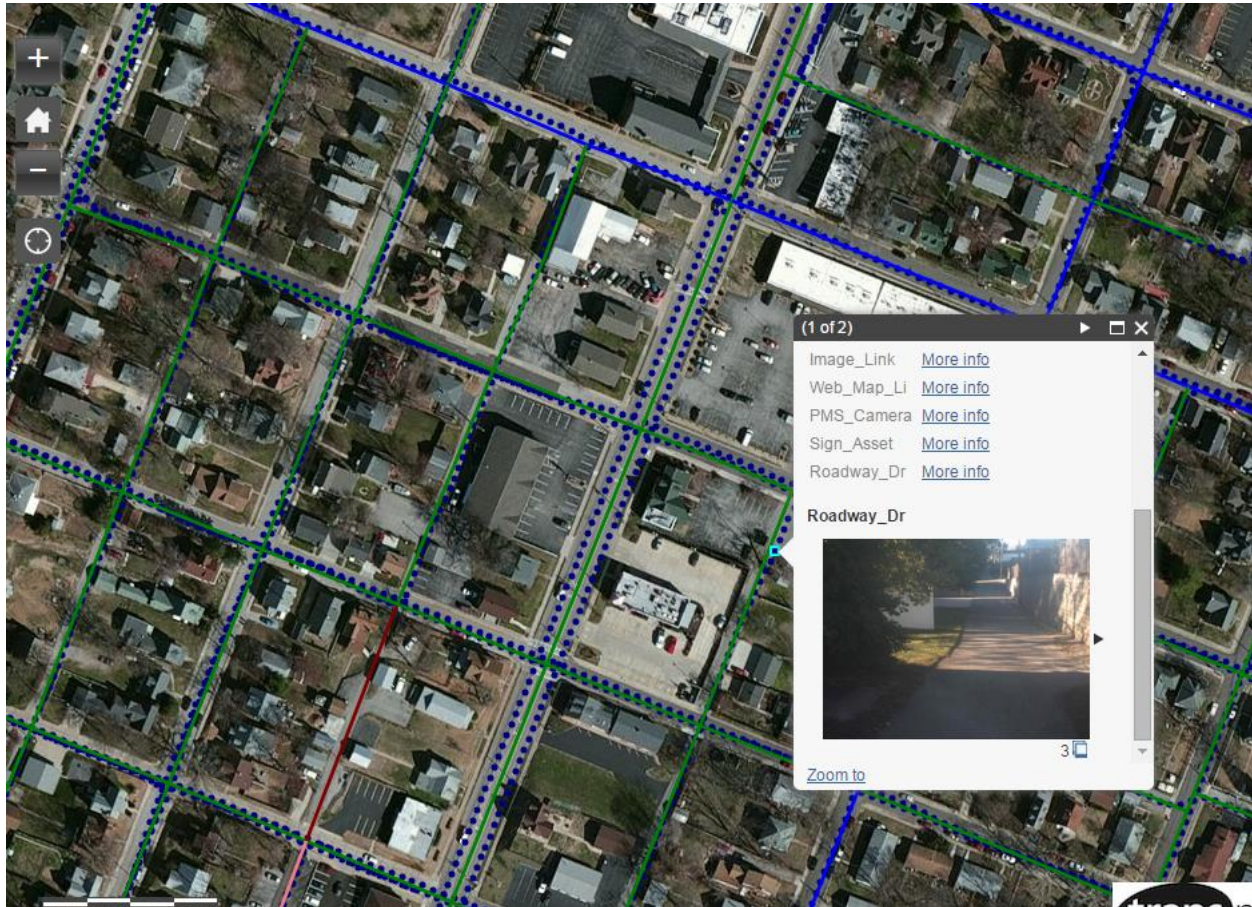


Figure 2: Sample Map of Data Points Collected

Once all the data was collected for the entire project Transmap could then proceed to creating the pavement networks and inspection records that would ultimately feed into MicroPAVER and form the basis for the current pavement condition rating.

PAVEMENT RATING

After the physical field data was collected the process of converting that raw data into a pavement rating database was initiated. The first step in the conversion process was to have a qualified inspector review the video collection from the field data and input the pavement distresses into Micropaver. Each distress is measured individually and is based on actual conditions of the representative samples. From this input the Micropaver software calculates the overall Pavement Condition Index for the sample units by applying deduction factors as determined by ASTM standard D6433-09. The sampling locations selected for each roadway segment were selected according to the ASTM standard and the individual sample locations are averaged over the segment according to the equations below.

$$PCI_s = PCI_r = \frac{\sum_{i=1}^R PCI_{ri} \times A_{ri}}{\sum_{i=1}^R A_{ri}}$$

Where

PCI_s = PCI of a pavement section

PCI_r = area weighted average PCI of random (or representative) sample units

PCI_{ri} = PCI of random sample unit number i

A_{ri} = area of the random sample unit i

R = total number of inspected random sample units

Step 2: If additional sample units are inspected, they can be used to enhance the section PCI as follows:

$$PCI_a = \frac{\sum_{i=1}^A (PCI_{ai} \times A_{ai})}{\sum_{i=1}^A A_{ai}}$$
$$PCI_s = \frac{PCI_r(A_s - \sum_{i=1}^A A_{ai}) + PCI_a \times \sum_{i=1}^A A_{ai}}{A_s}$$

PCI_a = area weighted average PCI of additional sample units

PCI_{ai} = PCI of additional sample unit number i

A_{ai} = area of additional sample unit i

A_s = total section area

Once the PCI has been calculated for the entire pavement network it provides a relative condition of each street within the pavement network at a single point in time as shown in the map below. In order to make better predictions about future pavement conditions additional information is considered along with the static pavement score to predict the likely deterioration curve for each roadway segment as discussed in the next section of this report.

City of St. Charles Long Range Pavement Preservation Plan



Figure 3: City of St. Charles Pavement Condition Index Map

City of St. Charles Long Range Pavement Preservation Plan

In addition to the PCI data calculated by the MicroPAVER software, Transmap provided International Roughness Index (IRI) data and Rutting data for the roadway network collected by the ground facing laser data collection. IRI data is a measure of the smoothness of a roadway and does not necessarily correlate to distress but can be helpful in confirming PCI data. IRI data is used by many state DOTs on major roadways since smoothness plays a large role in public perception and drivability of high speed roadways. Rutting data was collected using the same ground facing laser. Rutting is a measure of localized depression in asphalt roadways. Rutting data only applies to asphalt streets and therefore the rutting scores on concrete streets are shown as very high in the following map. Rutting is considered as part of the overall scoring that is computed for asphalt roadways in MicroPAVER. All three pavement condition results from the study were delivered to the City in both the MicroPAVER database and in GIS shapefile format. In addition a shapefile demonstrating the pavement sample areas was delivered to the City. This shapefile will be utilized to conduct field investigations to confirm deterioration curves in the future, or provide the basis for reevaluation of the same data in the future. Resampling the same sample areas in the future creates the basis for the deterioration modeling. As additional data points are added in the future, more realistic deterioration curves will be formed for the existing roadway network. These refined curves will provide greater confidence in the future pavement condition projections.

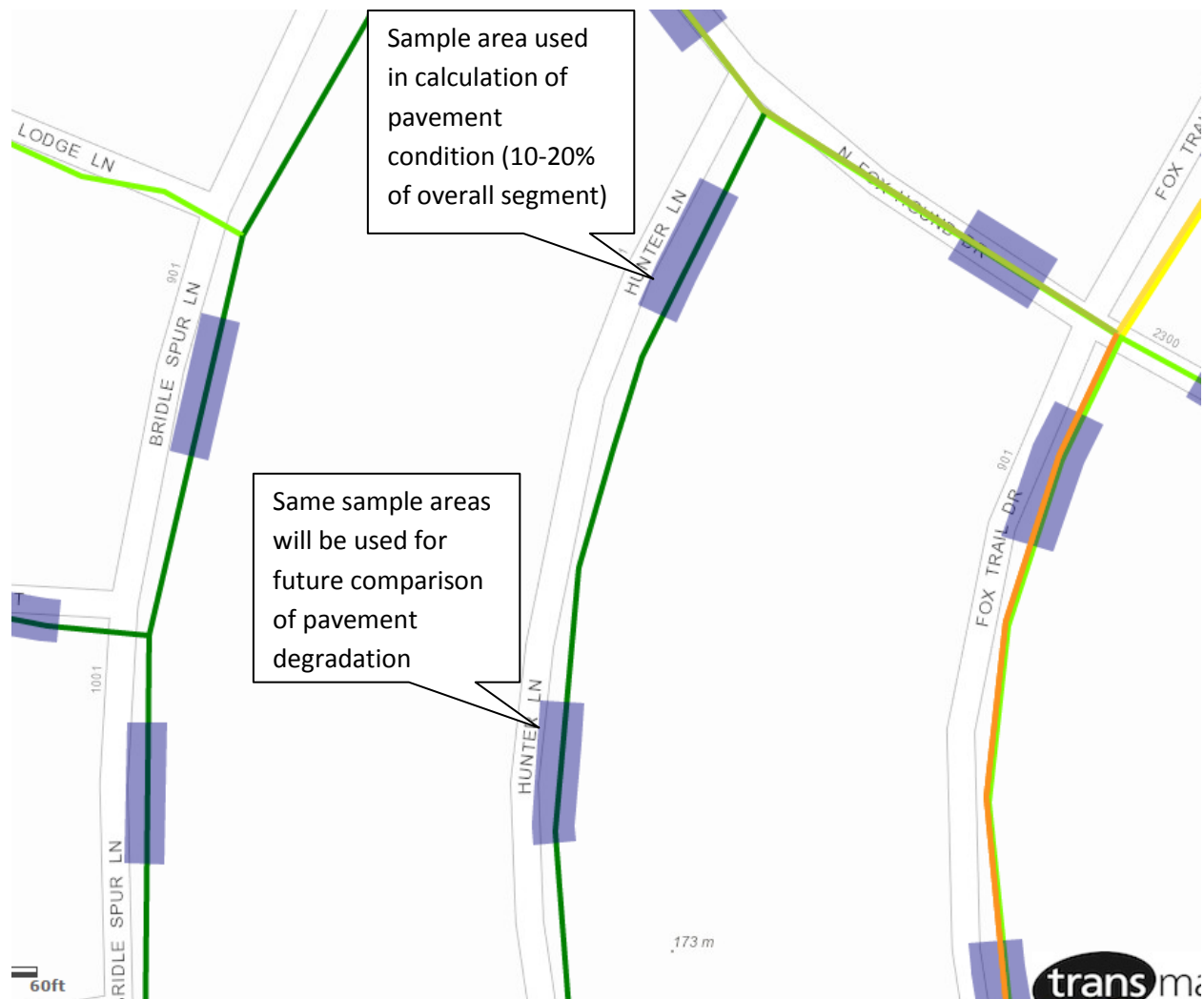


Figure 4: Sample Areas used for Micropaver Analysis

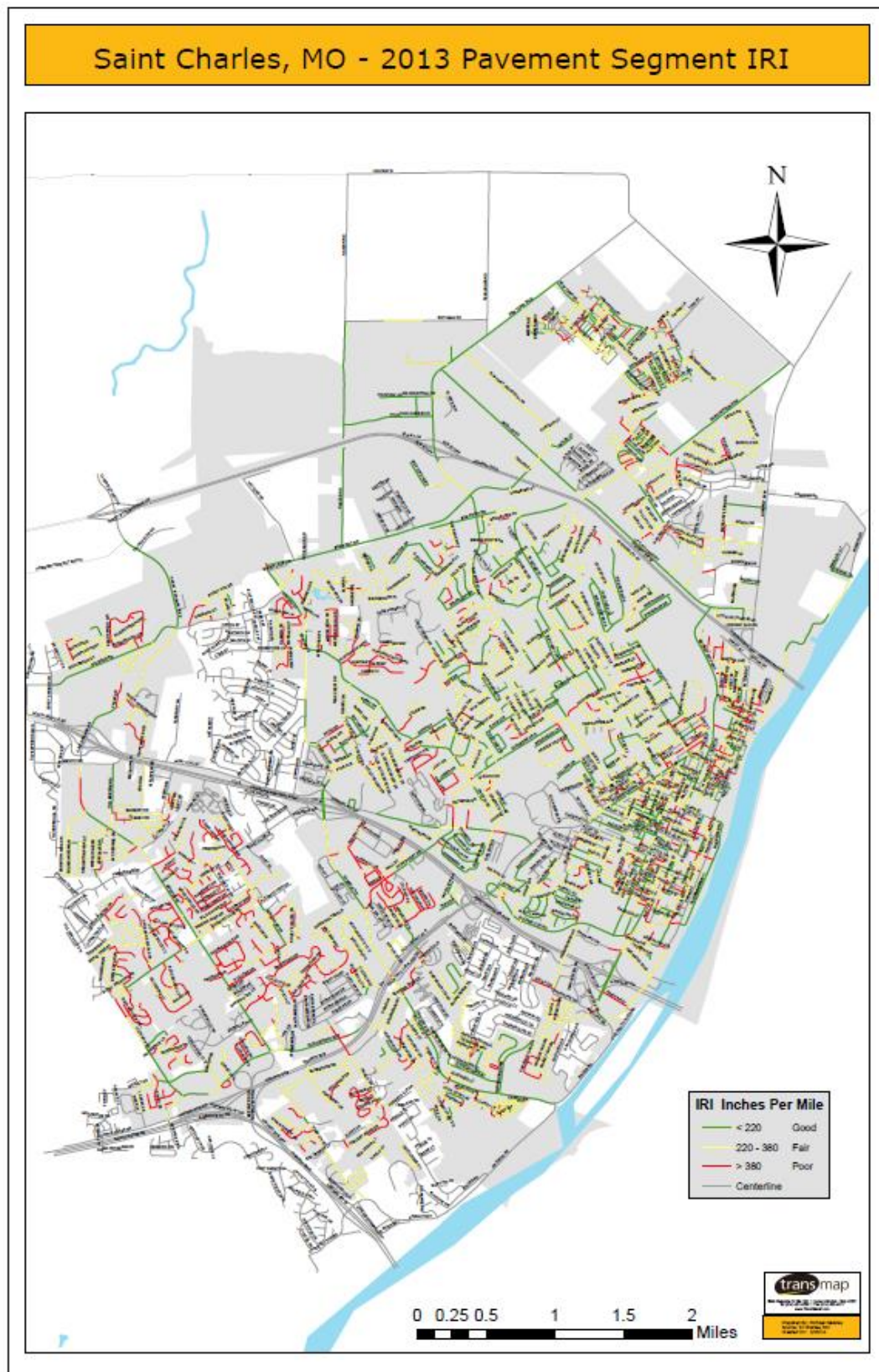


Figure 5: City of St. Charles International Roughness Index Data

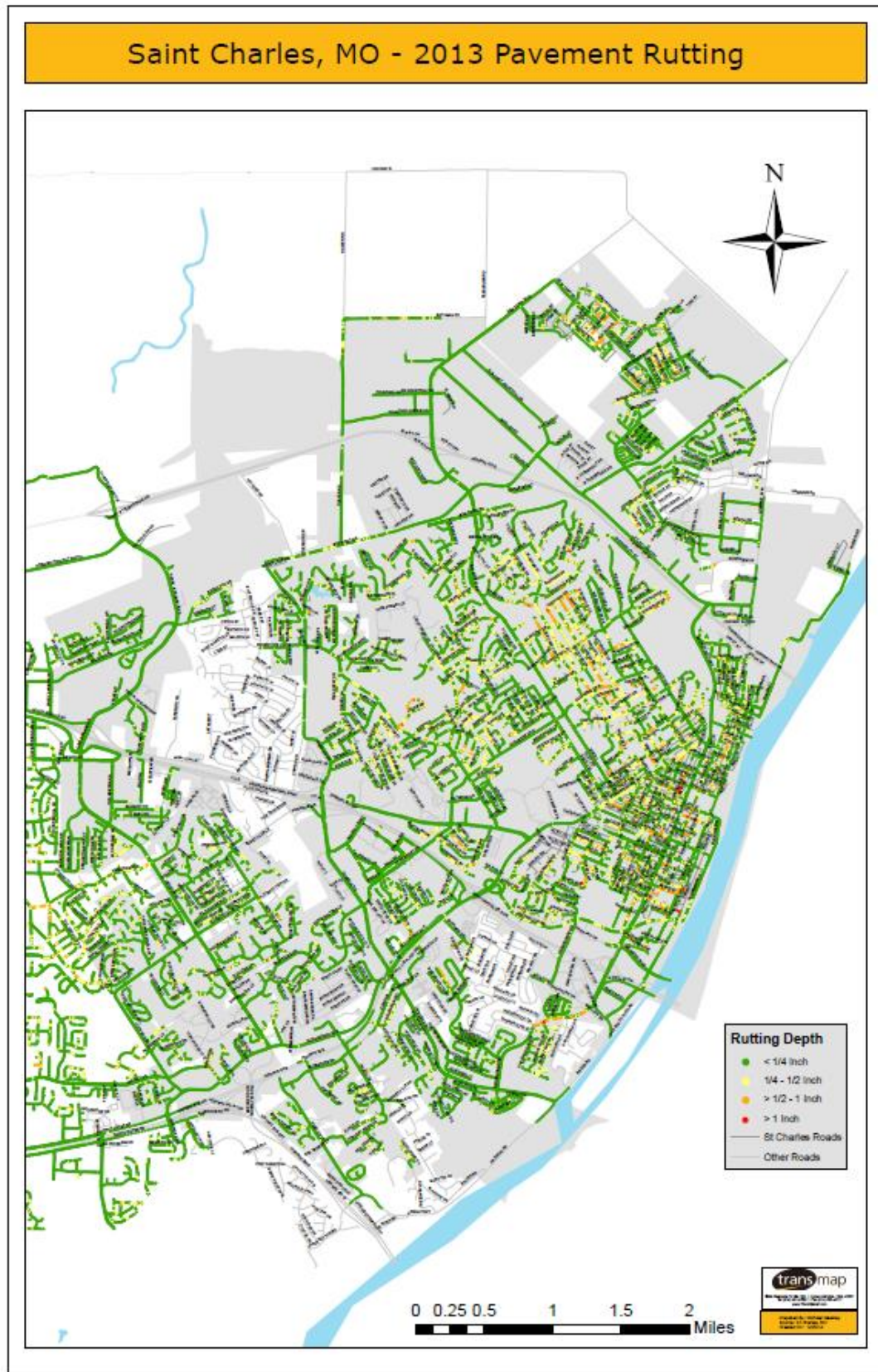


Figure 6: City of St. Charles Rutting Depth Data

FUTURE PAVEMENT CONDITION PREDICTION MODELING

While static pavement condition information can tell the condition of the pavement at a single point in time, it cannot tell how the pavement will continue to degrade going into the future. The dynamics of the pavement degradation curve are based on many factors including the age of the pavement, the traffic volume, the thickness of the pavement, the condition of the base and subbase, the pavement drainage conditions, weather, etc. These factors are grouped in MicroPAVER into families, or roads with similar characteristics. These roads are then compared to one another and plotted on a graph with a best fit curve to predict the future pavement condition of a roadway (see example below).

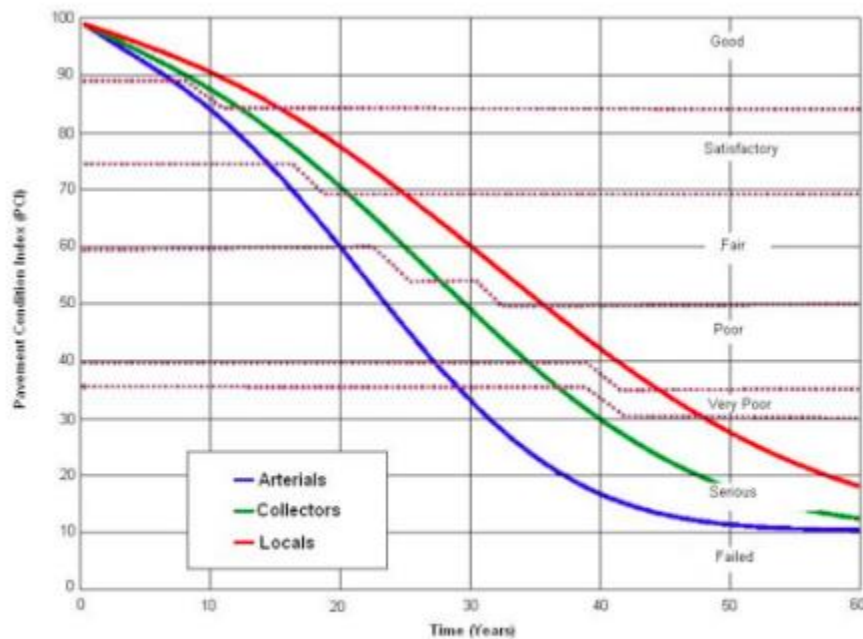


Figure 7: Standard Pavement Deterioration Curves

Where each pavement section falls within the deterioration curve will determine the appropriate treatment to preserve the life of the pavement. Pavement treatments have varying costs and varying benefits.

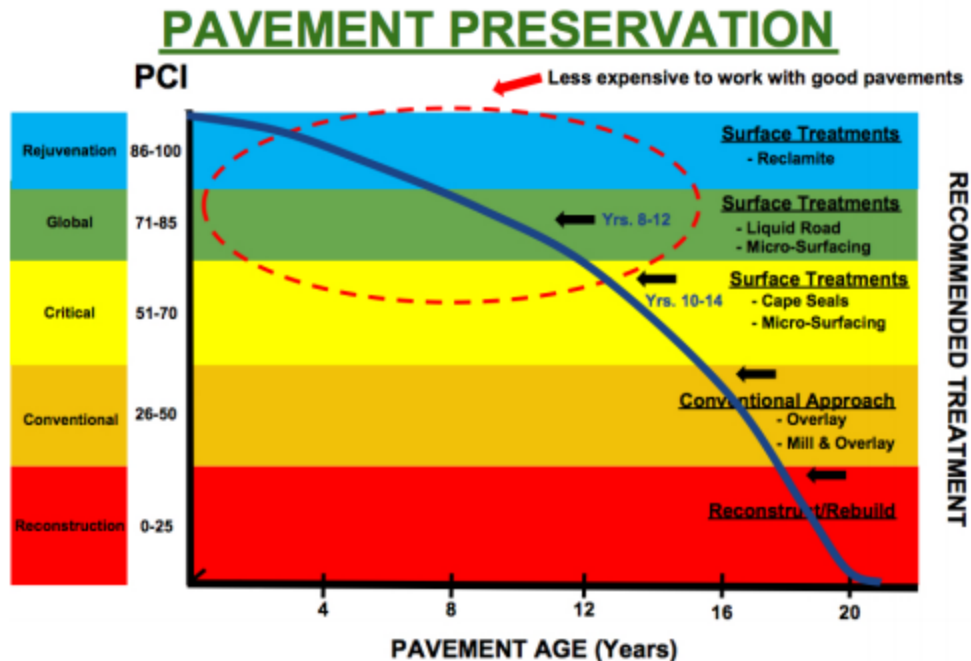


Figure 8: Pavement Treatment Options for each PCI Range

In general pavements that are in good condition cost less money to keep in good condition than improving the worst pavements to good condition. The goal of this predictive modeling analysis is to provide the appropriate pavement preservation treatment at the appropriate time in order to maintain the systemwide condition for the lowest possible cost.



Figure 9: Asphalt Preservation Treatment Toolbox Cost for Repair Type

This approach to pavement maintenance in the long run will provide the highest possible pavement condition for the lowest investment. However in implementing this strategy there is a definitive public perception that the worst roads should be addressed first, and that some favoritism is being afforded to those roads in better condition that are receiving treatment. It is important to educate the public on the way pavement degrades and the goal of a strategic approach to address pavements at critical times in

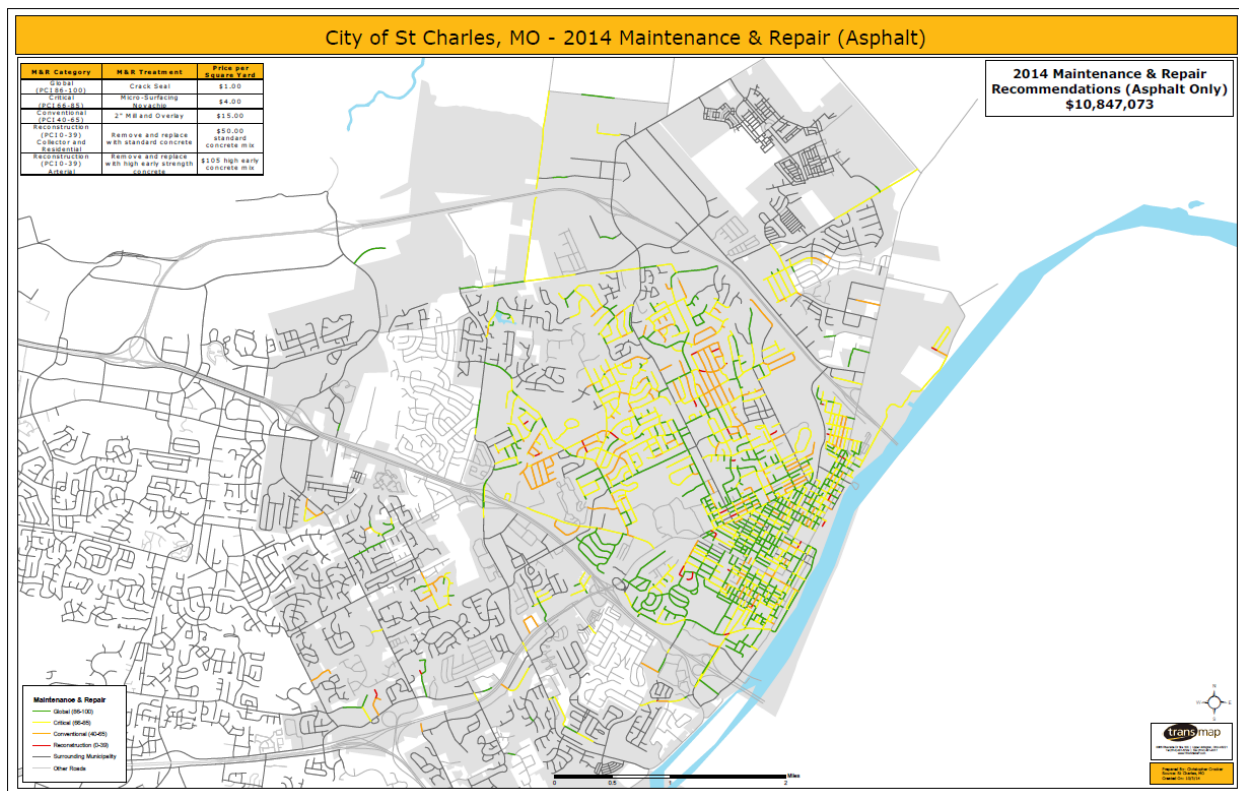
City of St. Charles Long Range Pavement Preservation Plan

their degradation curve. In addition the neighborhood approach clusters pavement rehabilitation projects into distinct areas of work that save the contractor mobilization costs of transporting and setting up equipment for completing the pavement rehabilitation. The following section will detail how this output is then utilized to make a strategic plan for which roads are addressed.

City of St. Charles Long Range Pavement Preservation Plan

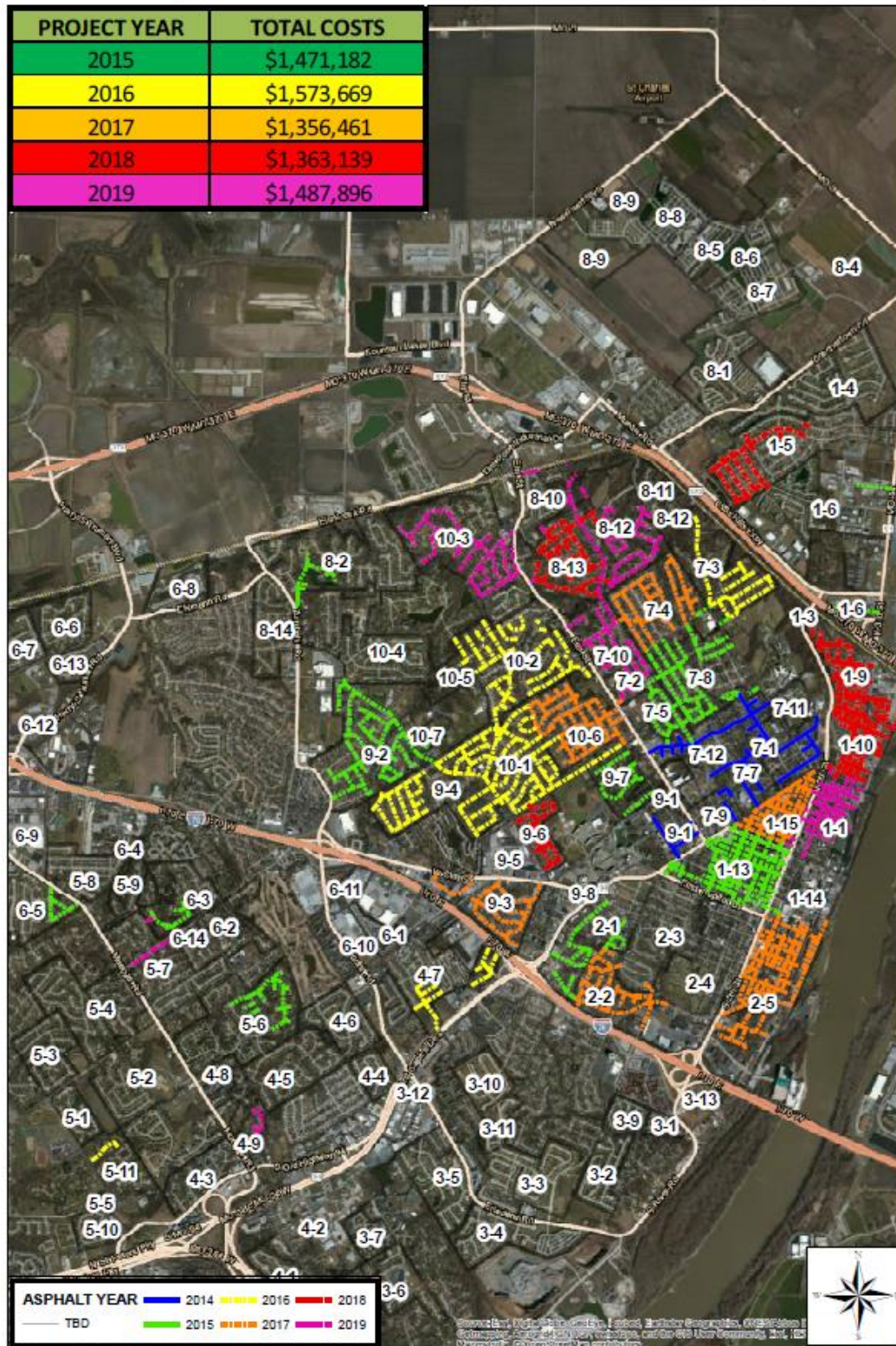
PROJECT PLANNING AND BUDGETING

Upon completion of the future pavement conditions modeling the results were ranked for various budget scenarios. Three budget scenarios were presented to the Street Committee and Council in February 2015 to illustrate the effect of differing levels of investment in the pavement network. The first scenario illustrated the cost required to fix all the current pavement defects, the second scenario illustrated the cost to maintain the current pavement condition average in the City, and the last scenario illustrated what the future pavement conditions will look like with the existing funding levels. The following figures illustrate the prioritized plan for these options.



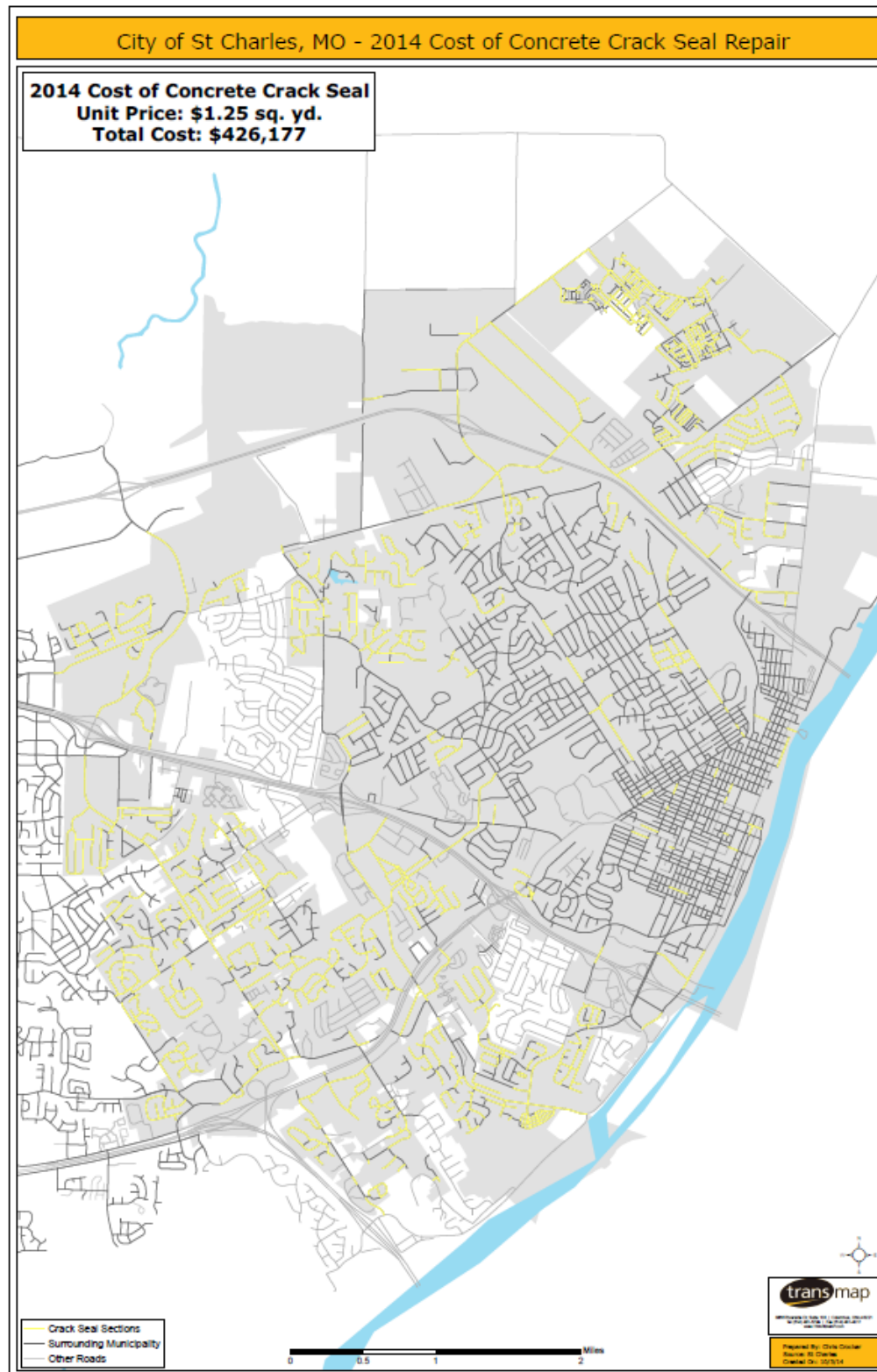
Asphalt Roads: Fix Everything

ASPHALT MAINTENANCE ZONES: HOLD CURRENT PCI



Asphalt Roads: Hold The Current System Pavement Condition (approximately \$1.5M annually)

City of St. Charles Long Range Pavement Preservation Plan



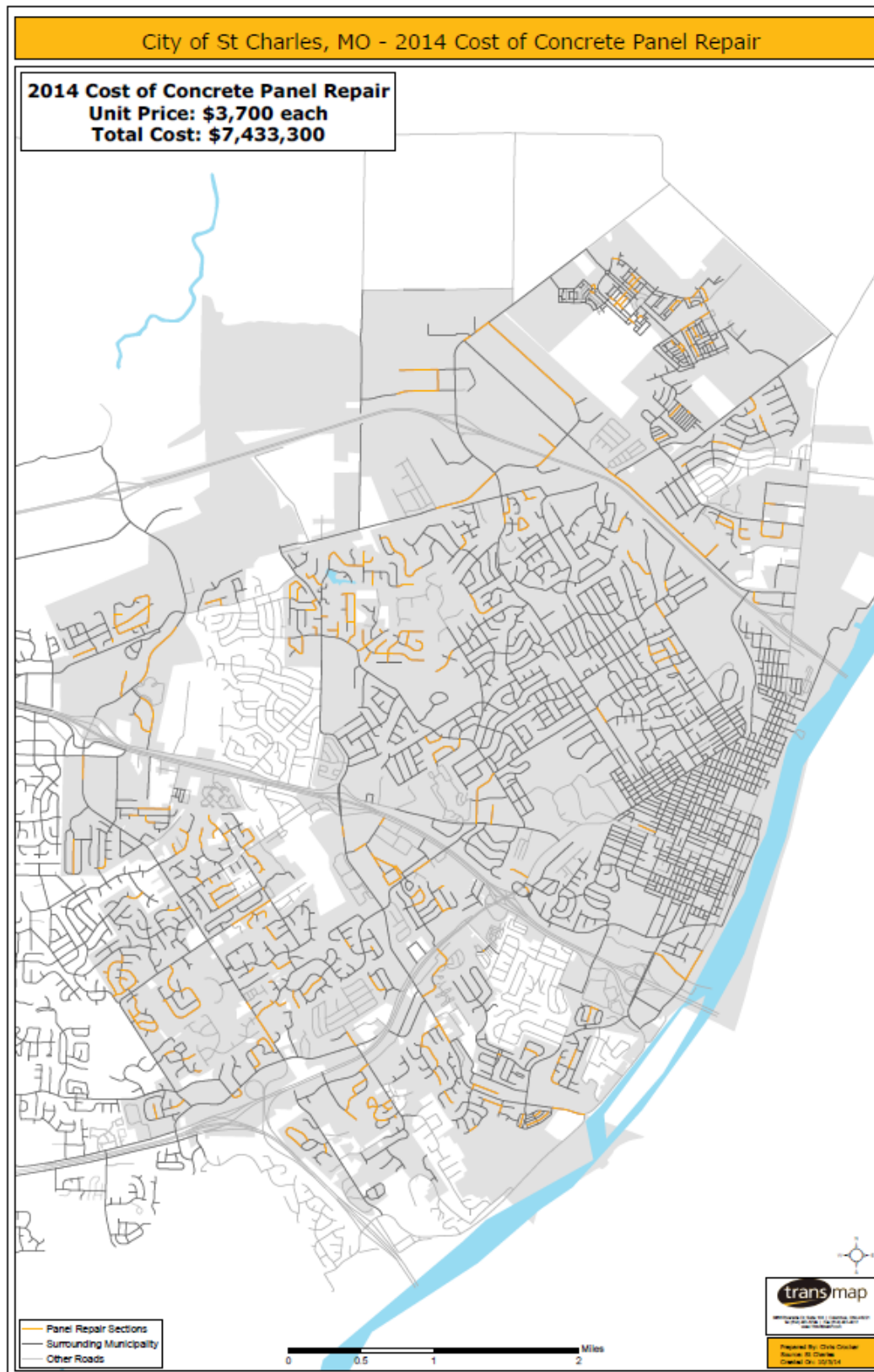
Concrete Streets: Crackseal All Needs In Current Year

City of St. Charles Long Range Pavement Preservation Plan



Concrete Streets: Full Reconstruction Roadways In Current Year

City of St. Charles Long Range Pavement Preservation Plan



Concrete Streets: Concrete Panel Repair Current Year

City of St. Charles Long Range Pavement Preservation Plan

CONCRETE MAINTENANCE ZONES: HOLD CURRENT PCI



City of St. Charles Long Range Pavement Preservation Plan

Staff recommended to Council at the February 2015 meeting and Council approved the plan to move forward with maintaining the existing funding level for the next five years for concrete and asphalt streets and increasing the sidewalk maintenance funding associated with this plan to \$300,000 annually. Following this five year plan will result in the predicted system PCI dropping for concrete streets by 5 points, and asphalt streets by 8 points.

Year	Zones	Ideal Pavement Plan	Ideal Sidewalk Plan	Proposed Pavement Plan	Proposed Sidewalk Plan
2015	1-6, 1-13, 6-3, 9-2, 10-7, 8-2, 9-7, 7-5, 7-8, 8-7, 8-10, 9-4, 4-5, 4-8, 4-3, 5-1, 5-3, 6-1	\$3.5 M	\$1.0 M	\$2.0 M	\$300 K
2016	8-2, 8-14, 5-10, 10-1, 9-4, 2-1, 5-11	\$3.5 M	\$400 K	\$2.0 M	\$300 K
2017	1-15, 2-5, 2-2, 9-3, 10-4, 4-4, 8-8, 1-14, 5-2	\$3.5 M	\$320 K	\$2.0 M	\$300 K
2018	4-7, 3-12, 3-2, 3-4, 3-7, 5-9, 1-5, 8-5, 1-9, 9-6	\$3.5 M	\$350 K	\$2.0 M	\$300 K
2019	10-5, 5-6, 5-7, 6-3, 6-8, 4-1, 8-6, 8-12, 8-13, 8-10, 10-3, 7-2, 4-9	\$3.5 M	\$780 K	\$2.0 M	\$300 K
Total		\$17.5 M	\$2.85 M	\$10.0 M	\$1.5M

Staff made this recommendation based on the high overall pavement scores throughout the City, the available funding levels, and the relatively minor difference in overall street network condition at the end of the five year period. However this strategy is not a long term solution, in the future additional resources will be required to maintain the overall system at an acceptable level.

City of St. Charles Long Range Pavement Preservation Plan

The figures below show the average concrete and asphalt streets based on the relative condition currently and at the end of the five year period.



Concrete Street PCI = 87



Concrete Street PCI = 82



Asphalt Street PCI = 79



Asphalt Street PCI = 71

City of St. Charles Long Range Pavement Preservation Plan

Recommended Pavement Prioritization

Figure 1: \$1 Million Annual Budget Concrete Subdivision Chart

St. Charles PCC Pavements \$1M Budget by Sub-division

12/19/2014

Sub-division	2015	2016	2017	2018	2019
1-1	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
1-4	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
1-5	\$0.00	\$0.00	\$0.00	\$36,431.06	\$0.00
1-6	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
1-10	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
1-13	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
1-14	\$0.00	\$0.00	\$32,334.94	\$0.00	\$0.00
2-3	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
2-4	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
3-2	\$0.00	\$16,142.96	\$21,408.96	\$0.00	\$36,109.49
3-3	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
3-4	\$0.00	\$49,371.53	\$34,529.47	\$0.00	\$0.00
3-5	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
3-6	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
3-7	\$53,105.88	\$0.00	\$0.00	\$0.00	\$127,577.73
3-8	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
3-9	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
3-10	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
3-11	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
3-12	\$0.00	\$0.00	\$12,075.51	\$21,859.26	\$0.00
4-1	\$0.00	\$24,773.80	\$0.00	\$0.00	\$0.00
4-2	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
4-3	\$0.00	\$68,252.91	\$0.00	\$0.00	\$0.00
4-4	\$0.00	\$0.00	\$31,827.56	\$0.00	\$0.00
4-5	\$0.00	\$39,732.69	\$73,477.04	\$57,335.53	\$0.00
4-6	\$0.00	\$0.00	\$48,963.48	\$0.00	\$31,969.26
4-7	\$61,023.48	\$80,401.60	\$0.00	\$193,578.88	\$90,932.68
4-8	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
4-9	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
5-1	\$22,050.86	\$0.00	\$27,312.49	\$10,816.14	\$0.00
5-2	\$0.00	\$7,782.65	\$0.00	\$0.00	\$0.00
5-3	\$49,768.12	\$15,016.43	\$26,432.92	\$0.00	\$0.00
5-4	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
5-6	\$0.00	\$30,922.65	\$15,070.10	\$40,422.94	\$0.00

City of St. Charles Long Range Pavement Preservation Plan

5-7	\$16,848.70	\$0.00	\$17,193.93	\$129,421.24	\$87,075.51
5-8	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
5-9	\$42,350.84	\$0.00	\$26,305.18	\$0.00	\$0.00
5-10	\$0.00	\$69,122.65	\$0.00	\$102,667.17	\$185,928.46
5-11	\$0.00	\$44,823.79	\$0.00	\$0.00	\$0.00
6-1	\$45,972.92	\$8,316.60	\$5,260.54	\$17,035.53	\$30,668.40
6-2	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
6-3	\$0.00	\$108,463.96	\$100,326.31	\$55,498.25	\$25,423.14
6-4	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
6-5	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
6-6	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
6-7	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
6-8	\$0.00	\$49,825.09	\$0.00	\$0.00	\$0.00
6-13	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
7-3	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
7-8	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
8-1	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
8-2	\$211,272.14	\$0.00	\$74,900.53	\$16,460.22	\$33,672.58
8-4	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
8-5	\$13,713.14	\$39,180.96	\$58,206.98	\$0.00	\$0.00
8-6	\$0.00	\$0.00	\$0.00	\$56,469.14	\$0.00
8-7	\$28,497.36	\$20,382.49	\$75,220.75	\$51,419.93	\$95,120.69
8-8	\$33,881.34	\$25,823.22	\$21,446.23	\$2,968.77	\$91,638.82
8-10	\$0.00	\$0.00	\$0.00	\$67,199.66	\$17,413.60
8-11	\$78,126.96	\$0.00	\$0.00	\$0.00	\$0.00
8-13	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
8-14	\$89,069.71	\$99,386.86	\$153,007.13	\$0.00	\$35,876.54
9-1	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
9-2	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
9-4	\$0.00	\$0.00	\$0.00	\$0.00	\$18,448.54
9-5	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
10-2	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
10-3	\$0.00	\$0.00	\$20,216.10	\$0.00	\$0.00
10-4	\$253,970.51	\$201,629.68	\$123,411.04	\$140,398.32	\$26,238.11
10-5	\$0.00	\$0.00	\$0.00	\$0.00	\$65,791.11

City of St. Charles Long Range Pavement Preservation Plan

Figure 2: \$1 Million Annual Budget Asphalt Subdivision Chart

**Asphalt
Pavement
St. Charles Summary Table
by Sub Division
Inflation 2.5%
per Year**

Sub Division	Sum of 2014_Cost	%increase 2015-2014	Sum of 2015_cost	%increase 2016-2015	Sum of 2016_cost	%increase 2017-2016	Sum of 2017_cost	%increase 2018-2017	Sum of 2018_cost	%increase 2019-2018	Sum of 2019_cost
7-12	\$98,292	31.8%	\$129,574	27.8%	\$165,641	9.1%	\$180,795	12.9%	\$204,060	2.5%	\$209,152
7-1	\$372,090	20.8%	\$449,496	5.2%	\$473,064	14.3%	\$540,845	6.0%	\$573,371	31.9%	\$756,562
9-1	\$101,499	11.1%	\$112,807	56.0%	\$176,033	8.3%	\$190,686	13.5%	\$216,521	22.5%	\$265,179
7-9	\$132,504	6.7%	\$141,418	69.2%	\$239,227	15.4%	\$276,109	8.9%	\$300,604	18.2%	\$355,433
8-9	\$2,952	310.0%	\$12,101	2.4%	\$12,397	2.4%	\$12,692	2.6%	\$13,016	2.5%	\$13,341
9-7	\$69,303	173.5%	\$189,509	2.5%	\$194,198	2.5%	\$198,985	2.5%	\$203,960	2.5%	\$209,034
6-3	\$13,467	101.9%	\$27,188	2.5%	\$27,865	11.3%	\$31,026	2.5%	\$31,815	16.4%	\$37,042
7-5	\$57,742	69.7%	\$97,999	2.5%	\$100,435	48.9%	\$149,547	2.5%	\$153,284	23.5%	\$189,365
1-6	\$94,766	65.8%	\$157,126	2.5%	\$161,023	7.2%	\$172,619	2.5%	\$176,945	36.5%	\$241,577
8-2	\$23,647	57.9%	\$37,334	18.8%	\$44,357	2.4%	\$45,433	2.5%	\$46,587	111.3%	\$98,425
9-2	\$351,799	48.9%	\$523,979	17.0%	\$612,858	22.2%	\$749,173	14.1%	\$854,914	10.4%	\$943,478
7-8	\$326,791	47.0%	\$480,385	7.0%	\$513,867	26.1%	\$648,073	7.5%	\$696,870	15.9%	\$807,654
1-13	\$152,727	35.1%	\$206,384	7.6%	\$222,042	12.1%	\$248,798	16.6%	\$290,111	24.6%	\$361,490
Total Year 1	\$1,093,192										
2-1	\$22,098	32.9%	\$29,359	35.0%	\$39,627	2.5%	\$40,605	16.9%	\$47,468	35.2%	\$64,177
10-1	\$344,381	8.6%	\$374,111	45.9%	\$545,644	11.8%	\$610,230	2.9%	\$628,185	27.8%	\$802,807
5-11	\$44,825	2.5%	\$45,961	241.5%	\$156,977	2.5%	\$160,892	2.5%	\$164,926	2.5%	\$169,050
9-4	\$389,343	2.5%	\$399,168	57.3%	\$627,772	37.0%	\$860,230	8.0%	\$928,994	10.1%	\$1,022,485
10-7	\$19,063	2.5%	\$19,539	284.4%	\$75,107	2.5%	\$76,966	2.5%	\$78,872	2.5%	\$80,826
Total Year 2			\$868,138								
2-5	\$159,444	24.8%	\$198,955	11.3%	\$221,490	48.7%	\$329,246	17.6%	\$387,343	20.4%	\$466,217
2-2	\$45,240	16.0%	\$52,464	8.5%	\$56,942	30.3%	\$74,170	2.6%	\$76,093	50.2%	\$114,298
10-6	\$238,384	14.6%	\$273,272	13.2%	\$309,432	37.1%	\$424,256	11.7%	\$473,683	29.9%	\$615,414
1-15	\$107,108	10.7%	\$118,563	6.6%	\$126,424	45.5%	\$183,915	13.1%	\$208,029	22.3%	\$254,332
8-4	\$1,206	2.0%	\$1,230	2.9%	\$1,266	309.5%	\$5,186	2.6%	\$5,319	2.5%	\$5,452
9-3	\$34,135	2.0%	\$34,818	2.9%	\$35,842	67.5%	\$60,026	2.7%	\$61,626	31.1%	\$80,795
Total Year 3					\$751,397						
4-7	\$117,098	16.2%	\$136,044	28.0%	\$174,140	2.4%	\$178,399	97.6%	\$352,561	3.3%	\$364,365
1-9	\$262,987	11.0%	\$291,787	7.8%	\$314,452	11.6%	\$351,081	30.9%	\$459,702	29.1%	\$593,447
1-5	\$118,697	2.5%	\$121,664	23.2%	\$149,913	9.0%	\$163,369	34.9%	\$220,405	31.4%	\$289,714
9-6	\$85,791	2.5%	\$87,919	9.8%	\$96,559	9.0%	\$105,217	42.9%	\$150,328	19.7%	\$179,919
Total Year 4							\$798,065				
8-10	\$25,772	13.0%	\$29,126	2.5%	\$29,845	2.5%	\$30,580	2.5%	\$31,341	84.2%	\$57,741
10-3	\$175,371	4.6%	\$183,505	20.7%	\$221,424	3.6%	\$229,377	2.5%	\$235,179	63.4%	\$384,185
5-7	\$11,478	2.5%	\$11,769	2.5%	\$12,060	2.5%	\$12,358	2.5%	\$12,664	241.8%	\$43,289
7-2	\$159,273	2.5%	\$163,287	2.5%	\$167,339	2.5%	\$171,492	2.5%	\$175,759	60.0%	\$281,280
7-11	\$39,895	2.5%	\$40,894	2.4%	\$41,893	2.4%	\$42,894	2.5%	\$43,988	256.1%	\$156,620
5-2	\$8,186	2.5%	\$8,390	2.4%	\$8,595	2.4%	\$8,800	2.6%	\$9,025	284.6%	\$34,708
3-10	\$6,804	2.5%	\$6,974	2.4%	\$7,144	2.4%	\$7,314	2.6%	\$7,501	284.6%	\$28,847

City of St. Charles Long Range Pavement Preservation Plan

8-13	\$245,262	15.2%	\$282,569	2.5%	\$289,544	19.0%	\$344,512	18.7%	\$409,083	41.5%	\$578,940
4-9	\$18,389	2.4%	\$18,825	2.6%	\$19,317	2.6%	\$19,817	2.6%	\$20,327	39.5%	\$28,351
								Total Year 5	\$944,868		
6-5	\$67,483	28.5%	\$86,686	23.3%	\$106,886	2.5%	\$109,531	2.5%	\$112,244	2.5%	\$115,025
5-6	\$131,917	21.8%	\$160,666	2.5%	\$164,633	4.3%	\$171,765	4.7%	\$179,891	26.8%	\$228,076
7-3	\$197,475	18.7%	\$234,310	27.7%	\$299,246	3.6%	\$309,953	2.5%	\$317,705	4.2%	\$331,097
2-3	\$294,247	17.7%	\$346,281	12.7%	\$390,289	19.5%	\$466,210	13.4%	\$528,646	6.7%	\$564,091
1-10	\$265,535	13.8%	\$302,150	15.6%	\$349,354	14.2%	\$398,961	20.5%	\$480,771	14.1%	\$548,414
2-4	\$154,310	13.2%	\$174,699	21.5%	\$212,309	18.7%	\$251,924	15.6%	\$291,278	6.0%	\$308,610
10-2	\$324,052	12.5%	\$364,535	33.8%	\$487,764	27.9%	\$623,676	26.6%	\$789,847	21.2%	\$957,426
1-1	\$187,170	12.0%	\$209,723	9.3%	\$229,229	24.8%	\$286,085	12.9%	\$322,919	16.1%	\$374,788
8-12	\$229,945	11.4%	\$256,193	2.5%	\$262,529	24.5%	\$326,746	4.4%	\$341,081	13.9%	\$388,419
7-4	\$635,051	10.0%	\$698,872	18.3%	\$826,555	26.3%	\$1,043,788	4.3%	\$1,088,682	12.8%	\$1,228,452
4-3	\$99,177	9.2%	\$108,285	2.5%	\$110,972	2.5%	\$113,721	2.5%	\$116,562	2.5%	\$119,465
7-10	\$223,959	5.4%	\$236,037	2.5%	\$241,868	5.3%	\$254,663	13.1%	\$288,111	34.6%	\$387,754
1-14	\$124,750	3.9%	\$129,625	10.8%	\$143,690	5.1%	\$150,978	10.7%	\$167,172	4.9%	\$175,413
8-11	\$5,365	2.5%	\$5,499	2.4%	\$5,634	2.4%	\$5,768	2.6%	\$5,915	2.5%	\$6,063
6-11	\$11,159	2.5%	\$11,438	2.4%	\$11,717	2.4%	\$11,996	2.6%	\$12,302	2.5%	\$12,609
Grand Total	\$7,429,404		\$8,820,494		\$10,514,423		\$12,461,473		\$13,993,585		\$16,930,687